Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application.

~~Listing of Claims~~:

1. (currently amended) A method for controlling a spark ignited engine operated with fuels of varying volatility ~~or~~ viscosity, comprising:

    generating an acoustic wave in proximity to the fuel;

    providing a signal related to viscosity or volatility of the fuel, said signal being derived from alterations in said acoustic wave caused by said fuel;

    providing a base ignition timing signal to the engine for predetermined engine operation; ~~and~~

    adjusting said base ignition timing signal in relation to said signal; **and**

    adjusting a fuel injection amount based in relation to said signal.

2. (original) The method recited in claim 1 wherein said generating further comprises at least one of propagating the wave into the fuel, or propagating the wave from a medium into the fuel.

3. (original) The method recited in claim 1 wherein said alterations in said wave include at least alterations in frequency, phase, amplitude, or propagation velocity.

4. (original) The method recited in claim 1 wherein said engine operation includes at least engine speed, engine load, throttle angle, or starting conditions.

5.   (currently amended) A method for controlling a multi
cylinder engine operated with fuels of varying volatility or
viscosity, comprising:

~~providing a signal related to viscosity or volatility~~
of the fuel, said signal being derived from alterations in a
source of energy directed into the fuel;

providing the fuel to at least one of the cylinders at
a timing related to a predetermined engine operation; and

adjusting said fuel timing **to an earlier or later
timing** in relation to said signal.

6.   (currently amended) A method for controlling a multi
cylinder engine operated with fuels of varying volatility or
viscosity, comprising:

providing a signal related to viscosity or volatility
of the fuel;

providing the fuel to at least one of the cylinders at
a timing related to a predetermined engine operation; and

adjusting said fuel timing **to an earlier or later
timing** in relation to said signal.

7.   (currently amended) A method for controlling a multi cylinder engine operated with fuels of varying volatility or viscosity, comprising:

generating a signal related to fuel viscosity;

~~inducting air into each of the cylinders;~~

delivering fuel to each of the cylinders in relation to said inducted air and a desired air/fuel ratio; generating a minimum air/fuel ratio in relation to said viscosity indication ~~(to)~~; and

preventing said delivered fuel from falling below a minimum amount corresponding to said minimum air/fuel ratio.

8.   (original) The method recited in Claim 7 wherein said minimum air/fuel ratio is selected to reduce combustion instability.

9.   (original) A method for controlling a multi-cylinder engine operated with fuels of varying viscosity, comprising:

generating an indication of fuel viscosity;

inducting air into each of the cylinders;

delivering fuel to each of the cylinders in relation to said inducted air to maintain an average desired air/fuel ratio; and

adjusting said desired air/fuel ratio in relation to said fuel viscosity indication.

10.   (original) The method recited in claim 9 further comprising feedback controlling injected fuel based on an exhaust gas sensor.

11.   (original) A method for controlling a multi-cylinder engine operated with fuels of varying viscosity, comprising:

  generating a signal related to fuel viscosity;

  inducting air into each of the cylinders;

  ~~delivering fuel to each of the cylinders in relation~~ to said inducted air to maintain an average desired air/fuel ratio;

  adjusting said delivered fuel in relation to feedback from an exhaust gas sensor; and

  further adjusting said delivered fuel in relation to said signal.

12.   (original) A method for controlling a multi-cylinder engine operated with fuels of varying viscosity, comprising:

  generating an indication of fuel viscosity;

  delivering fuel to each of the cylinders in relation to a desired engine output; and

  adjusting said delivered fuel in relation to said fuel viscosity to maintain said desired engine output.

13.   (original) The method recited in Claim 12 wherein said desired engine output includes at least a desired torque, a desired torque from a vehicle operator, a desired torque from a controller, or pedal position.

14.   (currently amended) A method for controlling a multi-cylinder engine operated with fuels of varying viscosity, the engine inducting fuel vapors from a fuel system into an engine air intake, comprising:

~~generating an indication of fuel viscosity;~~

delivering fuel to each of the cylinders; and

adjusting said delivered fuel in relation to said inducted fuel vapors ~~(flow, density....)~~ and said fuel viscosity indication.

15.   (original) The method of claim 14 wherein adjusting said delivered fuel in relation to said inducted vapors include adjusting said delivered fuel in relation to vapor flow and/or vapor density.

16.   (original) A system for a vehicle having a fuel tank coupled to an engine, comprising:

an acoustic wave sensor for sensing a quality of liquid fuel stored in the fuel tank; and

a controller for adjusting an amount of injected fuel based on said sensor.

17.   (original) The system of claim 16 where said fuel is gasoline.

18.   (original) A system for a vehicle having a fuel tank coupled to an engine, comprising:

an acoustic wave sensor for sensing a quality of liquid fuel stored in the fuel tank; and

a controller for adjusting an ignition timing of the engine based on said sensor.

19.   (original) A system for a vehicle having a fuel tank coupled to an engine, comprising:

a sensor for sensing viscosity of liquid fuel stored in the fuel tank; and

~~a controller for adjusting an amount of injected fuel~~ based on said sensor.

20.   (original) A system for a vehicle having a fuel tank coupled to an engine, comprising:

a sensor for sensing viscosity of liquid fuel stored in the fuel tank; and

a controller for adjusting an amount of injected fuel during an engine start based on said sensor.

21.   (original) A system for a vehicle having a fuel tank coupled to an engine, comprising:

a sensor for sensing viscosity of liquid fuel stored in the fuel tank; and

a controller for increasing an amount of injected fuel during an engine start.

22.   (original) A system for a vehicle having a fuel tank coupled to an engine, comprising:

a sensor for sensing viscosity of liquid fuel stored in the fuel tank; and

a controller for decreasing an amount of injected fuel during an engine start.

23.		(original) A system for a vehicle having a fuel tank coupled to an engine, comprising:

a sensor for sensing viscosity of liquid fuel stored in the fuel tank; and

~~a controller for adjusting an ignition timing of the~~ engine based on said sensor.

24.		(original) A system for a vehicle having a fuel tank coupled to an engine, comprising:

a sensor for providing an indication of viscosity and density of liquid fuel stored in the fuel tank; and

a controller for adjusting an ignition timing of the engine based on said sensor.

25.		(original) A system for a vehicle having a fuel tank coupled to an engine, comprising:

a sensor for providing an indication of viscosity and density of liquid fuel stored in the fuel tank; and

a controller for adjusting an fuel injected into the engine based on said sensor.

26.		(original) A system for a vehicle having a fuel tank coupled to an engine, comprising:

an acoustic wave sensor for sensing quality of liquid fuel stored in the fuel tank; and

a controller for adjusting an desired engine air-fuel ratio based on said sensor

27.   (original) A system for a vehicle having a fuel tank coupled to an engine, comprising:

a sensor for sensing viscosity of liquid fuel stored in the fuel tank; and

a controller for determining an expected engine speed during engine starting, comparing said expected speed to actual engine speed during said engine starting, and adjusting an amount of injected fuel based on said comparison and/or said sensor.

28.   (original) A system for a vehicle having a fuel tank coupled to an engine, comprising:

a sensor for sensing viscosity of liquid fuel stored in the fuel tank; and

a controller for determining degradation of said sensor, and adjusting engine operation using a default operating mode based on said determined degradation.

29.   (original) A system for a vehicle having a fuel tank coupled to an engine, comprising:

a sensor for sensing viscosity of liquid fuel stored in the fuel tank; and

a controller for receiving an output of said sensor, estimating said output based at least on parameters other than said sensor output, and determining degradation of said sensor based on said estimate.

30.   (original) A system for a vehicle having a fuel tank coupled to an engine, comprising:

an acoustic wave sensor for sensing a quality of liquid fuel stored in the fuel tank; and

a controller for adjusting an engine operating parameter based on said sensor.

31.   (original) A system for a vehicle having a fuel tank coupled to an engine, comprising:

a sensor for sensing viscosity of liquid fuel stored in the fuel tank; and

a controller for adjusting an engine operating parameter during an engine start based on said sensor.

32.   (original) A system for a vehicle having a fuel tank coupled to an engine, comprising:

a first sensor for sensing viscosity of liquid fuel stored in the fuel tank;

a second dielectric sensor for measuring content of said liquid fuel stored in the fuel tank; and

a controller for adjusting an engine operating parameter based on said first and second sensors.

33.   (original) A method for controlling a multi cylinder engine operated with fuels of varying volatility or viscosity, comprising:

providing a signal related to viscosity based on a rate of change of an exhaust system sensor; and

adjusting fuel injection in relation to said signal.

34.   (new) The method of claim 5 wherein said engine directly injects fuel into a combustion chamber of the engine.